TEMPERATURE TMDLs
COLUMBIA/SNAKE RIVER MAINSTEM

Questions and Comments
from the July, 2001 Informal Workshops

EPA has provided informal responses to questions and comments raised the TMDL workshops held in Spokane, Washington and Portland, Oregon on July 23 & 24, 2001 respectively. These responses have been shared wirh the states and tribes for their review.

The questions and comments have helped to alert EPA and others to issues of concern to the community. They have already influenced some of the thinking regarding the Temperature TMDLs.

The draft TMDL will be made available to the public in early 2002. EPA will hold a public comment period which will allow for verbal and/or written comments on the draft TMDL . Additional information on this process will be forthcoming.

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The meetings, questions and comments were informal in nature.

The questions and comments have been divided into two categories: 1) questions for immediate clarification, and 2) questions for on-going consideration.

The questions for immediate clarification have been answered in writing. These are questions that can currently be answered with a high degree of certainty. The remaining questions have been listed without written responses. Answers to these questions would be speculative or may require further modeling or data. Even if questions have not been answered, they have been thought provoking and some have already resulted in re-thinking of aspects of the Temperature TMDLs.

TEMPERATURE TMDLs
QUESTIONS FOR IMMEDIATE CLARIFICATION

1. What type of rivers is this model (RBM-10) applicable to? (7/23/01)
RBM10 estimates the temperature of a river segment based on (1) estimated heat inputs to the water surface based on meteorological data and river geometry and (2) heat flowing into the segment from upstream segments and tributary inflows. The model is applicable to any river, typically a large river, where temperature is primarily governed by these two factors. It would not be applicable in a river where temperature is significantly affected by other factors that are not part of the RBM10 model (e.g., riparian shading).

2. What does the point source data look like? What is its quality? (7/23/01)
The data is currently being compiled and assessed.**.**

3. Have you included social benefits and costs in the TMDL process? (7/23/01)
Social benefits and costs are considered in state implementation plans, **after** a TMDL has been issued.

4. When will we see on the ground work to save fish? When will there be action/implementation? What are the possible outcomes of a TMDL?(7/23/01)
The TMDLs will provide quantitative targets for achieving Water Quality Standards. After the TMDL's have been issued, the states have the responsibility to develop on-the-ground implementation plans that will result in achieving the targets set by the TMDL.

It should be noted that EPA, the states, and tribes have been working with dam operators and others to improve water quality on the Columbia and Snake Mainstem.

5. How do elevated temperatures impact fish ability to deal with TDG? (7/24/01)
We will evaluate the effect of temperature on fish ability to deal with TDG.

6. What is the schedule for the temperature model preliminary results. (7/24/01)
We hope to have the preliminary results in a the next two months.

7. Where did you measure temperature? You need to make sure you take temperature readings at the same location/depth each time. (7/23/01)
EPA is using 30 years of monitoring information collected by the U.S. Army Corps of Engineers and other agencies to develop this TMDL. Most of the monitoring information is collected at fixed locations/depths in the river that are above, within, or below the dams. While the available data is sufficient for development of a sound TMDL, EPA would like to see improvements in the current temperature monitoring programs to provide better estimates of the cross-sectional average temperature of the river over time.

8. What is the diurnal variation in the river? (7/24/01)
Data indicates approximately a three to four degree daily variation in temperature on the Columbia River, both before and after human activities.

10. How linked is EPA's TMDL process with regional temperature task force criteria? (7/24/01)
They are separate projects, however, the two project teams are sharing information. Adoption of regional temperature criteria is a long range project. The TMDL will be written to meet the **current** criteria.

11. Is the model designed to predict daily average temperatures? (7/24/01)
The model can simulate daily or hourly average water temperatures. It can also be used to predict highest hourly average temperature experienced during the day, a measure comparable to the daily maximum temperature.

12. Is the existing condition for temperature comparable for the tailrace and forebay?(7/24/01)
The TMDL is focused on the average temperature of the river, and EPA believes the difference in cross-sectionally averaged temperatures at tailrace and forebay locations is relatively small. On 30 sampling days between July and October of 1992, the Columbia River Inter-Tribal Fish Commission (CRITFC) collected cross-sectional temperature data at 14 locations in the Snake River. EPA has analyzed the data from locations immediately upstream and downstream of the four Snake River dams in the study area (Lower Granite, Little Goose, Lower Monumental, Ice Harbor). The mean difference between upstream and downstream temperatures ranged between 0.1 and 0.4 degrees Celsius at these four dams.

13. Which location was used for the standard deviation calculation? Scroll case, tailwater, or forebay? (7/24/01)
Forebay data was used for the standard deviation calculation, because tailwater data was not continuously collected until 1995.

14. What is the frequency of temperature measurements? (7/24/01)
There have been numerous temperature monitoring programs across the basin, and the frequency of sampling has varied widely. Most of the temperature information for the mainstem Columbia and Snake Rivers has been collected on daily or hourly basis at the dams.

15. How does the Kalman filter determine which estimate to utilize (measurement or process model)? (7/24/01)
The Kalman filter is not used in order to choose between the measurement estimates and process model estimates. The estimated temperature from RBM10 (in the impounded condition) is calculated using both measurements and model outputs. The Kalman filter algorithm is used to track the deviations between measurements and process model outputs, and to determine a weighting factor that minimizes error and thereby provides an improved estimate of the river temperature.

16. When will the modeling results be available for the Columbia River below Bonneville? (7/24/01)
We are in the process of modeling this reach. We hope to have preliminary findings in the next

two months and a full report by December 2001.

TEMPERATURE TMDLs
QUESTIONS FOR ON-GOING CONSIDERATION

These questions have been listed without written responses. Answers to these questions would be speculative or may require further modeling or data. These questions and comments have already helped to alert EPA and others to understand and consider issues of concern to the community. Some have already influenced aspects of the approach to Temperature TMDLs.

The draft TMDL will be made available to the public in early 2002. EPA will hold a public comment period which will allow for verbal and/or written comments on the draft TMDL . Additional information on this process will be forthcoming.

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1. How does the temperature model work on reservoirs? How does it work comparing reservoirs with different elevations vs. run of the river reservoirs? (7/23/01)

2. Can you use the mobile meteorological stations to verify data? It looks like you're underestimating temperature in low flow years. Need to check for bias. (7/23/01)

3. What are the effects of tributaries on temperature? Can you look at the impacts of the Pend Orielle River and the Wahneta Dam? (7/23/01)

4. How does standard deviation data compare with the cross sectional average? (7/23/01)

5. How are you going to characterize the river with grab samples? (7/23/01)

6. Can temperature standards ever be attained given the local physical and meteorological conditions? (7/23/01)

7. Is the heat problem cumulative - is equilibrium considered in the model? Why not use site potential in Canada? (7/23/01)

8. Have you identified methods for cooling with and without dams? (7/23/01)

9. How will implementation of the TDG TMDL impact the Temperature TMDL and dam operations? (7/23/01)

10. Could actions taken as a result of the TDG TMDL impact/conflict with temperature issues or vice versa? (7/23/01)

11. Would the river eventually reach equilibrium? How long would it take between cooling periods? (7/23/01)

12. Do you expect temperature stratification in the reservoirs when modeling for pre-dam temperature differences? How is it possible to assess stratification? How can a one-dimensional model express stratification? (7/23/01)

13. Did you compare air temperature at the Bonneville Dam for the two 18 year periods? What are the effects of climate change on the increased river temperatures? (7/23/01)

14. Did you compare a river that is similar to the Columbia but has no impoundments? You might want to consider using the Frazier River which has no impoundments in order to gauge the relationship between human and natural activity on temperature. (7/23/01)

15. Have we met WQS in headwater streams? If not, how can we expect to meet standards downstream? (7/23/01)

16. Is there any option to separate the Temperature TMDL into geographic sections? (Mid-Columbia/Upper-Columbia/Snake)? (7/23/01)

17. What is EPA's role on the Upper Columbia? (7/23/01)

18. If stratification is evident, is a one-dimensional model appropriate? (7/24/01)

19. For the model are you using the temperature coming across border for background? Is WA stuck with what we get coming across the border or can we ask Canada to make improvements to water quality? (7/23/01)

20. Is EPA modeling the tributaries for heat input? How can you predict tributary the contribution? (7/24/01)

21. Are the tributaries having a cumulative impact on the mainstem? (7/24/01)

22. Will the point sources have an impact? (7/24/01)

23. Where are the temperature inputs coming from? (7/24/01)

24. You should run a simulated vs. observed model for where the Salmon River meets the Snake River. (7/23/01)

25. Seasonal changes can be significant in various stages and in the impounded river and need to be taken into consideration. (7/23/01)

26. The Bureau of Reclamation has more comprehensive data that is available and can be provided. (7/23/01)

27. Point sources have good, long term data for many parameters that could be used. (7/23/01)

28. I don't believe that the TMDL is ~~not~~ designed to deal with temperature, there are too many variables. The TMDL should consider the heat load from Canada. In the model, is the flow from Canada considered background? Flow conditions need to be included in both pre and post dam scenarios. (7/23/01)

29. Many conditions are not captured in the model. Do we really know what natural conditions were? (7/23/01)

30. You need to better define Mid-Columbia region/boundary (and transboundary contributions). (7/23/01)

31. You should do a UAA on the Columbia. Can standards really be attained? Is it necessary to support biological needs? (7/23/01)

32. Compare low vs higher flow in different years. Look for similar flow regimes before and after human activities. (7/24/01)

33. Compare fall and spring chinook temperature needs. (7/24/01)

34. The records from the Anatone and Burbank USGS gauges (1930's) should be reviewed for additional temperature data. However, care should be taken with Anatone as it is on the west bank below the Grande Ronde River. When the Grande Ronde is running hot, tributary temperature might influence the temperature readings at this gauge. (7/24/01)

35. The scroll case data indicates that cooler temperatures may not be indicative of the real conditions - not conservative enough. (7/24/01)

36. The forebay at McNary is very difficult to work with. (7/24/01)

37. How much contribution do the tributaries have on the mainstem? (7/24/01)

38. What role does the TMDL have in FERC relicensing? (7/23/01)